

Agricultural Research Institute, Pusa

Report on the Flax Experiments conducted
at Dooriah during the year 1910-11

BY

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Explanation of Plates.

- I.—View of a flax field (Pusa) at harvest time.
- II.—Preparing to ret flax in an indigo vat at Dooriah, Behar, the property of Sir Lewis Hay, Bart., and others. The bundles of straw, of which alternate ones are inverted, are packed tightly, in a perpendicular position in the vat. Bamboo *jaffri* is placed over the straw and beneath the heavy beams. When the water enters, the straw is allowed to rise about a foot from the bottom of the vat, but is prevented from going further by the *jaffri*, which keeps it in position during the remainder of the retting process, lasting from 6 to 18 days, according to the temperature of the water.
- III.—A power flax breaker at Dooriah, Behar. By passing the dry retted straw through the fluted rollers, the woody portion of this straw is broken up into small portions which are easily detached by the gentle hushing action of the scutching wheel in the next process.
- IV.—View of a power flax scutching plant, at Dooriah, Behar. The form of the scutching wheels and the method of extracting the fibre from the "broken" flax straw are clearly indicated. The wheels are all in one shaft, which is connected, at one end, to the driving power, by suitable gearing.

ERRATA.

In 1909-10 Report, page 2, line 16; *for* “ 1 maund 15 seers ” *read* “ 1 maund 19 seers.”

In 1909-10 Report, page 6, Table of Manures; *for* “ acre ” *read* “ 25 cuttas.”

PLATE I.



View of a Pan Field (Pana) at Harvest Time.
The Rice Harvested Separated at the Office of the Survey of India, Calcutta in 1911

INTRODUCTORY.

I HAVE been asked by the Hon'ble Mr. T. R. Filgate, General Secretary to the Behar Planters' Association, Limited, to give my views on the experimental work on flax which is being carried on at Dooriah Factory. This work was started for the purpose of ascertaining whether flax could be profitably grown and manufactured in India, but more especially whether this could be done on indigo estates in Behar where the land and climate was thought to be suitable to its cultivation and where the buildings and vats of indigo factories could be utilized for the retting and scutching. With this view, a Belgian Flax Expert was engaged and brought out by Government and placed in Dooriah Factory, the proprietors of which had already been experimenting in the production of this fibre. The arrangements were that Government should pay for the salary and other expenses of the Expert and that the Dooriah Factory should give land, buildings and other facilities for the growth and manufacture of the crop, and that the Behar Indigo Planters' Association should supervise and control the work. With this view, Mr. Vandekerkhove was engaged for five years. Three of these have been completed, and it seems opportune that the results of these three years should be brought prominently before the members of the Association so that they may judge for themselves the value of the results so far achieved and may consider the best way of utilising the services of the Expert for the remaining period of his engagement.

I have for the past two years visited the experiments at Dooriah and made myself personally acquainted with the work there. On my advice the present report not only discloses the profit and loss on the working of last year's crop, but details have been inserted on both sides of the account showing the cost and realisation of particular items, and estimates have been framed giving the probable capital and recurring cost for the convenience of any one who desires to avail himself of information disclosed by the work which has been done at Dooriah and who may wish to start an enterprise of his own.

The net profits obtained from the returns of the season of 1909-10 are Rs. 53-9-7 per *bigha* on an area of 60 *bighas* or Rs. 61-5-0 per acre. The figures which will be found on Table II are actualities with the exception that the flax has been taken at present market valuation as it is not yet sold. Any discrepancy on this account can be made good on the news of the sale of the flax being received. It is worthy of note that the amount realised from seed forms an important item in the account.

From the study of the figures given in Mr. Vandekerkhove's report it should be possible to work out whether it is worth the while of members of the Association starting flax-growing on their estates now and so be in a position to obtain the advice and assistance of Mr. Vandekerkhove during the next two years. In other words, it would seem that the work at Dooriah has now got beyond the experimental stage and that the time has come when the industry might be developed by members of the Association if they desired to do so. If my conjecture is right it is only proper that any one so inclined should have the opportunity of making use of the advice of the Expert before the term of his engagement comes to an end.

I might further point out that there are various aspects from which this new industry can be viewed. The chief occupations are (a) the growing of the flax, (b) its retting and scutching and preparation for the market. Both sets of operations can be performed by the planter, in which case the whole of the time and money required would have to be supplied by him. It is possible, however, that the growing of the flax only can be done by the planter and the retting and scutching by a combination under separate capital. It is, therefore, worthy of consideration whether the planter should do all operations himself, or whether the industrial aspect could not be carried on under separate capital. If the latter method is adopted, it would be necessary to raise this capital by means of a Syndicate or co-operative arrangement and in order that charges may be as low as possible it would be advisable to purchase an indigo factory in some central place so that buildings and machinery could be had at reasonable cost. These matters appear to be worthy of the attention of the members of the Association, and it is chiefly with this object that I have written these few remarks in order that an enterprise, which appears to have some promise of success, may not fail for want of due consideration by those most interested and that the assistance given by Government may be used to the best advantage.

As this report is of interest not only to the Behar Planters' Association, Limited, but also to the general public, I have undertaken, with the approval of the Secretary to the Association, to publish it as a Bulletin of the Pusa Agricultural Research Institute.

B. COVENTRY,

Offg. Insptr.-Genl. of Agriculture in India.

PUSA; }
The 2nd April, 1911. }



Photo by the Japan Export to the
Office of E. H. Zinsler.

Photo by the Japan Export to the Office of E. H. Zinsler.

Preparing to ret Flax in an Indigo vat at Doorial, Behar.

PLATE III.



U. S. GEOLOGICAL SURVEY, PHOTOGRAPHIC BRANCH, WASHINGTON, D. C.

PLATE III. POWER PLANT, BELAR.

A power plant breaker at Doudria, Belar.

Report on the Flax Experiments Conducted at Dooriah during the year 1910-11.

General.—I am told that the land at Dooriah is now in its normal condition again, there having been sufficient rainfall during the monsoon followed by a good *hattia* (Elephant shower). Although our flax crop is not a bad one it is not up to my expectations. We had looked forward to distinctly improved prospects when once normal conditions were re-established, after the three successive years of drought. We have now 93 *bigas* under flax, the results obtained from which will be published in next year's report.

It is especially in the high lands, some of which are freshly manured, that the crop is most defective. On the other hand we have a field which has had two crops taken off it since it was sowed, which will give us about a 12-anna crop; and another one which has had two cuttings of indigo taken off it, now carrying a flax crop estimated at from 10 to 12 annas. These are good lands but not exceptional. Judging from results of flax sown after indigo, much better results would have been obtained, if the "khoonties" which were practically a failure, had been dug up early, the land prepared and flax sown down in good time. It is clear from the present outlook that light soil and also poor soil is useless for flax. High lands and other unmanured lands must be carefully selected, and I think it advisable to leave them fallow during the rains so that sufficient moisture is secured to encourage the plant during its growth and to ensure a successful germination of the seed. I notice from this year's crop that the fields left fallow which could be prepared in time, will yield a fairly good crop.

It is proposed next year in Dooriah to green-manure with "Sann Hemp" and a proportion of lands so manured will be sown in flax for experimental purposes. I have never seen it tried on flax before; but I believe in its efficiency with other crops, from personal experience of small scale trials. It serves two purposes, as a rotation and as a manure.

Time of Sowing.—We sowed a *biga* of flax on the 9th of October; it grew well and quickly at the beginning, but soon it seemed to suffer somehow. I believe this to have been due to the heat, for the heads

turned yellow and only revived somewhat with the first rain. The next field was sown on the 16th of October and this did well. This leads me to finally decide that sowings before the 15th October are not advisable.

Intervals between years of sowings.—We had also one *bigha* sown in a field where we had flax in the season 1907-08 and it is an absolute failure.

Results of last year's experiments with Chemical Manures.—The following are the results of the experiments with chemical manures described in last year's report, page 6 :—

No. of plot.	Rippled straw.	Seed.	Flax fibre.	Flax tow.	Percentage of tow.	Percentage of fibre.
	<i>Mds. S. Ch.</i>	<i>Mds. S. Ch.</i>	<i>Mds. S. Ch.</i>	<i>Mds. S. Ch.</i>		
1	12 20 0	1 6 12	0 30 13	0 20 0	40	6.16
2	9 20 0	1 0 0	1 0 6	0 16 0	4.21	10.62
3	7 0 0	0 39 12	0 38 12	0 17 4	6.16	13.81
4	8 20 0	0 34 8	1 3 14	0 17 12	5.22	12.90
5	9 0 0	0 36 12	0 33 2	0 14 6	4.0	9.20

As pointed out in the last year's report, page 7, these results cannot be relied upon to show the yields per acre, the figures are, however, comparable amongst themselves.

The results show that the percentage of fibre comes out highest in plot 3, plot 4 is the next highest, then 2 and 5, and last 1 on which the plant was encouraged to grow too fast by too heavy manuring. The quality of the fibre obtained from this plot was bad, green and short. The best fibre was from plot 3. No. 2 was also soft and comes next to 3 in quality. No. 4 was long, hard and brownish. No. 5 was somewhat softer than 4. The only notable distinctions with regard to the market value were with regard to Nos. 3 and 1, the former for the better and the latter for the worse.

The results thus go to show that an addition of sulphate of potash may be recommended and also a moderate amount of superphosphate, say 4 maunds of sulphate of potash mixed with 1 or 2 maunds superphosphate to the acre. This seems to be confirmed by this year's experiments.

Dehati Linseed.—We also had last year an experimental plot of "Dehati" linseed. We prepared the land as for foreign flax seed and divided the plot into 4 lots: two seeded, two unmanured. The size of

PLATE IV.



1. The first part of the paper is devoted to the study of the properties of the function $f(x)$ defined by the equation

the plots were 5 *cuttas* and 2½ *cuttas*, but to make the figures clearer I have expressed the results obtained from each plot on the *bigha*.

No. of plot.	Rate of sowing per <i>bigha</i> .	Rippled straw.	Seed.	Flax fibre.	Flax tow.	Percent- age of fibre.	Percent- age of tow.
		<i>Mds. S.</i>	<i>Mds. S. Ch.</i>	<i>Mds. S. Ch.</i>	<i>Mds. S. Ch.</i>	<i>Mds. S. Ch.</i>	
Seeded {	1	1 0	41 20 0	13 2 0	3 22 0	2 23 0	8.55
	2	0 10	25 12 0	11 12 0	1 22 0	1 34 0	6.12
Not manured. {	3	1 0	30 34 0	9 39 0	1 30 0	1 32 0	5.67
	4	0 10	15 24 0	6 30 0	0 32 0	1 13 0	5.12

Distinctly the best results are given by the heavier rate of sowing on both the unmanured and the "seeded" plots.

The longest fibre was given by the seeded plots and is therefore of better value. The average marketable value of the fibre manufactured as above would be, in my opinion, £40 a ton. I daresay we may get more for it this year, but flax is exceptionally high this winter. The tow is not very good and it is possible that it will not sell very favourably. We have in Dooriah large fields of native linseed growing this year in addition to our 93 *bighas* under flax. These fields were prepared rather late. With an earlier sowing, it might have grown a little taller which would make all the difference. I will try to extract the fibre from it and report on it next year.

The following four tables show —

- (1) the sowings per field and their harvesting results ;
- (2) the working and manufacturing costs of the above with the results, probable value and nett balance in connection with the Dooriah capital outlay ;
- (3) the present Dooriah capital outlay ;
- (4) the cost of buildings and machinery required for the manufacturing of 100 to 120 *bighas*.

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Flax Expert to the Bihar Planters' Association.

TABLE I.
Sowings per field and their harvesting results.—Season 1909-10.

No. of field.	Kind of manures.	Date of sowing.	Total flax sown.	Seed sown per bush.	Weight of flax per sown.	Seed returns.	Average of flax per sown.	Average of seed per bush.
			<i>B. G. D.</i>	<i>Mds. S.</i>	<i>Mds. S. Ch. Mds. S. Ch.</i>	<i>Mds. S. Ch.</i>	<i>Mds. S. Ch.</i>	<i>Mds. S. Ch.</i>
1	Seeded and manured.	31st October 1909	5 0 0	1 20	127 10 0	16 16 4	25 20 0	3 11 0
2	Seeded	3rd and 4th November 1909.	7 5 0	1 20	316 20 0	25 1 12	43 20 0	3 18 0
3	Ditto	12th November 1909	8 5 0	1 20	330 20 0	30 22 8	40 0 0	3 28 0
4 A	Ditto	13th November 1909	0 2 10	1 0	5 7 8	1 25 4	41 20 0	13 2 0
4 B	Ditto	Ditto	0 2 10	0 10	3 6 8	1 16 8	25 12 0	11 12 0
4 C	Not manured	Ditto	0 5 0	1 0	7 28 8	2 19 12	30 34 0	9 39 0
4 D	Ditto	Ditto	0 5 0	0 10	3 36 0	1 27 8	15 24 0	6 30 0
4 A	Chemical manure	11th November 1909	0 5 0	1 20	12 20 0	1 6 12	50 0 0	4 27 0
4 B	Ditto	Ditto	0 5 0	1 20	9 20 0	1 0 0	38 0 0	4 0 0
4 C	Ditto	Ditto	0 5 0	1 20	7 0 0	0 39 12	28 0 0	3 39 0
4 D	Ditto	Ditto	0 5 0	1 20	8 20 0	0 34 8	34 0 0	3 18 0
4 E	Not manured	Ditto	0 5 0	1 20	9 0 0	0 36 12	36 0 0	3 27 0
4	Seet watered.	18th November 1909	6 0 0	1 15	294 30 0	17 5 12	49 5 0	2 34 4
5	Fallow	5th and 6th November 1909.	5 5 0	1 20	137 30 0	11 26 8	25 0 0	2 8 12
6	Ditto	18th November 1909	2 11 0	1 25	42 20 0	4 5 8	16 30 0	1 24 12
6	Seet watered.	13th November 1909	5 5 0	1 15	266 30 0	20 38 0	51 0 0	3 39 8
7	Seet watered.	Ditto	5 0 0	1 15	203 30 0	16 33 12	40 30 0	3 14 12
7	Seet watered.	14th November 1909	6 17 0	1 20	160 0 0	20 30 12	23 20 0	3 11 4
8	Ditto	Ditto	1 0 0	1 20	21 30 0	1 24 0	21 30 0	1 24 0
8	Ditto	Ditto	3 4 0	1 20	52 20 0	5 7 0	16 10 0	1 8 0
8	Ditto	14th November 1909	2 7 0	1 20	28 10 0	2 4 8	12 0 0	1 0 0

Had seed.

TABLE II.

Working and manufacturing outlay on the above fields with the results and their probable value.

Liphas 59 Cuttas 19. Rippled straw—Mds. 1,994-8-8. Seed—Mds.

184-23. Flax fibre—Mds. 188-31-6. Flax tow—Mds. 130-10.

Retted in all about 60 days and scutched 43 days.

Rs. a. p.

FARM EXPENDITURE.

Dooriah, Shagpore and Karamari—rent—			
<i>Bighas</i> 60 × Rs. 3	180	0	0
Dooriah, Shagpore and Karamari all labour including sowing	230	1	0
Dooriah, Shagpore and Karamari all labour from sowing till stored away including cleaning of seed	342	2	0
Seed sown { 81 maunds 30 seers imported seed.			
Sutton & Co	1,035	0	0
Transport by sea for above	108	0	0
Bill of Exchange, Lohing, clearing, etc., in Calcutta	93	1	3
Transport Calcutta, Motipur, Dooriah	78	6	0
Seed sown—11 maunds acclimatised seed at Rs. 5-0-0 per maund	55	0	0
Seed sown—2 maunds 20 seers, Dehati seed at Rs. 5-0-0 per maund	12	8	0
Carting the flax to store house	33	3	9
<i>Thatties</i> for cleaning storehouse	6	7	6
Repairing <i>chatties</i> , cost of bamboos and making new <i>chatties</i> , jute-bags (all for stacks)	36	15	6
<i>Sabi</i> string for tying bundles	17	0	3
Insurance	47	0	0
Duhan Mate till flax is stored	17	12	9

MANUFACTURING PROCESSES.

Rolling.

Cement for repairing vats and Pinmen necessities as jute, stoppings bags	6	1	6
Cleaning vats and road making	2	15	0
Repairing <i>chatties</i> for vats	5	15	0
Stoker watering vats	4	8	6
Fuel „ „	63	7	9
Oil for engine	18	12	0

TABLE II—*contd.*MANUFACTURING PROCESSES—*contd.*

<i>Fettiv;—contd.</i>		<i>Rs. a. p.</i>
Oil for killing mosquitoes on vats		3 15 0
Pinnan		7 9 9
Duhan Mate till retting finished		14 0 0
Retting, everything included except carting		98 12 9
All the carting from storehouse, during the retting and then to breaker		96 8 0
<i>Scutching.</i>		
Cleaning and repairing scutching house		8 10 4
Cost of various articles used in scutching house		5 11 0
Cleaning and repairing engine		11 6 8
Cost of stoppings for engine		2 5 0
<i>Thallies</i> for scutching house and <i>Gharanies</i>		10 0 9
Breaking, scutching, assorting including <i>Mistri</i> and Stoker for engine		319 5 6
Oil for Portable Engine		45 9 0
Grease for Cog wheels		13 8 0
Engine <i>Mistri</i>		9 0 0
<i>Baling and Freight.</i>		
Baling and sewing		13 5 0
Jute and gunny cloth		72 2 9
Carting to Motipur		9 14 0
Railway freight to Calcutta		184 7 0
Bill of Exchange, Lading, clearing, etc., in Calcutta		127 11 0
Steamer freight		495 5 2
<i>Doorish Extra Charges.</i>		
European establishment Rs. 3 per <i>bigha</i>		189 0 0
Native establishment Re. 1 per <i>bigha</i>		60 0 0
Using Engine at Rs. 5 per day		215 0 9
Interest on capital Rs. 7,450 at 10 per cent.		745 0 0
Interest on outlay consisting in farm expenditure and manufacturing process Nos. 1, 2 and 3 Rs. 3,944 at 8 per cent.		315 8 0
<i>The total expenditure up to delivery at the port of destination is thus as follows:—</i>		
	<i>Rs. a. p.</i>	
Farm expenditure	2,292 10 0	
Manufacturing processes	748 1 6	
Other charges	2,418 4 11	
	<hr/>	
	5,459 0 5	

TABLE II—*concd.*

PROBABLE RETURNS AND NETT BALANCE, 1909-10.

<i>Returns.</i>			
	<i>Rs.</i>	<i>a.</i>	<i>p.</i>
Seed sold or sown in following season. . . .	1,171	3	6
If the flax arrives in time at destination and can be sold with this winter's market conditions Rs. 33 per maund (cost deducted) may be obtained=			
188 mds. x Rs. 33 per maund	6,204	0	0
Tow—130 mds. x 10 Rs. per maund	1,300	0	0
TOTAL	8,675	3	6

<i>Balance.</i>			
	<i>Rs.</i>	<i>a.</i>	<i>p.</i>
Total returns	8,675	3	6
Total expenditure	5,459	0	5
Nett balance	3,216	3	1
TOTAL	3,216	3	1

Rs. 3,216-3-1 for 60 *bighas* = Rs. 53-9-7 per *bigha* or $53-9-7 \times 1.14558 =$ Rs. 61-5-0 per acre.

N.B.—Always considering that we obtain the prices indicated.

TABLE III.

The present Dooriah Capital Outlay.

	<i>Rs.</i>	<i>a.</i>	<i>p.</i>
(1) Addition to scutching house (part of it existing as also the engine shed)	1,000	0	0
(2) Machinery inside scutching house, breaker and press	4,500	0	0
(3) Cooling house	50	0	0
(4) Storehouse with <i>cali</i> flooring for flax straw	1,800	0	0
(5) Storehouse for broken flax about	100	0	0
TOTAL	7,450	0	0

TABLE IV.

Buildings and machinery required for the manufacturing of 100 to 120 bighas.

	Rs.	a.	p.
(1) A storehouse in brick, covered water-tight in grass, floored with <i>chhalies</i> , having a capacity of 70,000 cubic feet or, say, $150' \times 32' \times 10'$ Cost about	1,800	0	0
(2) A scutching house in bricks with corrugated iron roof $120' \times 20' \times 15'$ and engine shed	2,200	0	0
(3) A house in mud or brick to store bundles from breaker $40' \times 20' \times 5'$ water-tight in grass. Cost about	200	0	0
(4) A cooling house in mud $60' \times 15' \times 4'$ (partly underground, water-tight, grass covered). Cost about	100	0	0
(5) A press-house big enough for assorting and storing bales, say $60' \times 15' \times 8'$ in brick and water-tight covered. Cost about	1,000	0	0
(6) Machinery required inside scutching house	4,000	0	0
(7) Press, about	500	0	0
(8) Portable 15 H. P. about	6,000	0	0
(9) Centrifugal pump, about	500	0	0
* (10) Vats for retting 18,000 cubic feet at Rs. 600 per 1,000 cubic feet	10,800	0	0
(11) Reservoir for water 4,500 cubic feet. Cost about	8,000	0	0
TOTAL	35,100	0	0

* N.B.—This may be reduced if they can be built partly underground.

From Table No. IV each one interested should make out a private list of the additional buildings and machinery required, and his own capital outlay and the interest thereon. He also should work out his own figures as to the amount and interest on working and manufacturing outlay, European and Native establishment, taking into consideration that under normal market conditions the price of the fibre may go down to Rs. 30 and sometimes to Rs. 27 per maund which corresponds to £54 and £50 a ton.

To make an estimate on capital for the manufacturing of 5 to 600 *bighas*, Table IV should be taken as a basis. Items 1, 2, 3, 4, 6 and 10 may be multiplied by 5, items 7, 8, 9 and 11 by 2 or 3.

Proposals for 1911-12—We will next year experiment on :

- I. Green manuring.
- II. The value of the retting water as a manure.
- III. The value of three years' acclimatised seed.

We shall also :—

- IV. Go further into the matter of the intervals between the years of re-sowing flax in the same field.
- V. Work off and give an accurate account of the results of the present crop.

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